GEOGRAPHICAL RECORD.

AFRICA.

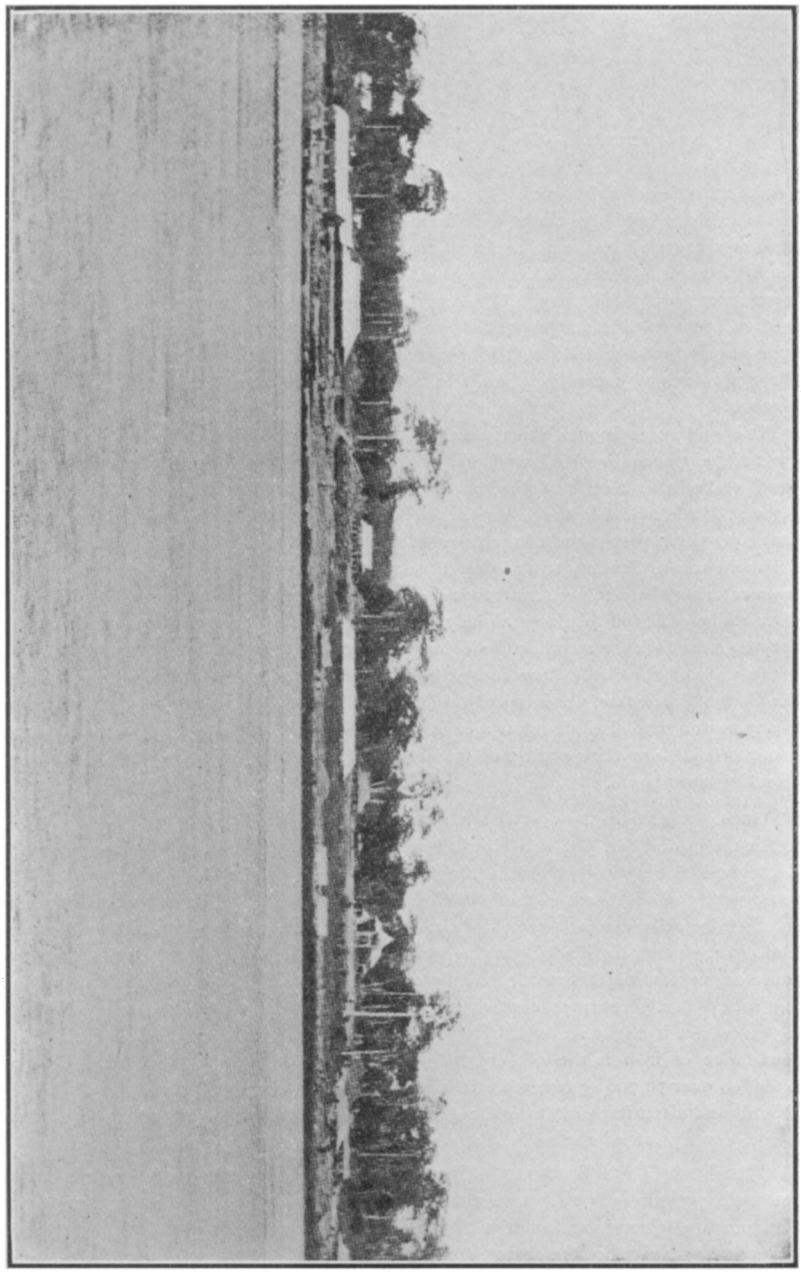
SLEEPING SICKNESS.—The distribution and spread of sleeping sickness in the Congo Free State are treated in the Fourth Progress *Report* of the expedition of the Liverpool School of Tropical Medicine, 1903–1905. The report is written by Dr. John L. Todd, who associates with himself in joint authorship the late Dr. Dutton, head of the expedition, who became a martyr to his devotion to this philanthropic and scientific work. Twenty-three months were spent in the Congo, and some 2,000 miles were traversed by the party. Three maps show the distribution of sleeping sickness in the Congo in 1884 and 1897, and the intensity with which the various districts have been affected by the disease. The expedition found that sleeping sickness follows the main lines of communication, and is often carried into new districts by infected persons.

It is still spreading with terrible rapidity. Cases, probably coming from the west, have already been reported, at Ujiji, on the east coast of Tanganyika; also at the south end of this lake at Moliro, and in the most northerly parts of the Congo Free State at Wadelai and in the Lado enclave. It is recommended, in order to prevent, as far as possible, the spread of the disease, that posts of inspection be established along the main routes leading to uninfected districts in order to prevent infected persons from entering these regions, and that cases of the disease found at posts in uninfected districts be removed to places already infected. It is believed that these measures, if they do not check the advance of sleeping sickness, will at least greatly retard it.

In view of the devastation caused by the sleeping sickness among the natives of the Congo Free State, the King of the Belgians has offered a prize of 200,000 francs to any person who shall discover a cure for the sickness, and also an additional sum of 300,000 francs for the purpose of making researches and experiments toward exterminating the plague.

GEOLOGY AND PETROLOGY OF A PART OF THE CONGO FREE STATE.—Mr. G. F. J. Preumont and Mr. J. Allen Howe have written a paper (*Quarterly Journal* of the Geological Society of London, Aug., 1905) describing what was learned of the geology of the northeast part of the Congo Free State by Mr. Preumont's journey in 1902. The observations were chiefly in the upper Mobangi basin from Tambura and Lado in the north to Wadelai in the south between the Congo and the Nile. They cover only a part of this region, chiefly along the rivers. Granite is the predominating rock. Mr. Preumont demonstrated the absence of fossiliferous deposits in a region where it might reasonably have been expected that they would occur. The abundance of iron in the old crystalline rocks is noteworthy. The investigation extended over 70,000 square miles in a region where a geological survey was rendered difficult and often impossible by the dense vegetation. Mr. Howe contributes a petrological description of the rocks that elucidates Mr. Preumont's observations.

THE NEW CONGO RAILROAD.—The Congo State, on September 1, completed the railroad, 75 miles long, between Stanley Falls and Ponthierville on the upper Congo, thus circumventing the Stanley Falls series of rapids. The railroad around the rapids in the lower Congo between Matadi and Leopoldville, completed in 1898, was built by private enterprise. The new railroad is the first one to be built by the Government. The purpose of the State is to build rail-



STANLEYVILLE.

roads around all the Congo rapids, so that there shall be uninterrupted steam communication between the mouth of the Congo and the head of navigation on the Lualaba head stream of the great river. The entire system of communications will be completed within the next two or three years. Steam communication between the Congo mouth and the end of navigation will then be divided between the land and water routes as follows:

River from Banana to Matadi, 90 miles; railway from Matadi to Leopoldville, 335 miles; river from Leopoldville to Stanleyville, 900 miles; railway from Stanleyville to Ponthierville, 75 miles; river from Ponthierville to Kundu, 195 miles; railway from Kundu to Buli, 276 miles; river from Buli to the head of navigation on the Lualaba, about 300 miles; total length of continuous steam communication on the Congo, 2,471 miles, of which 1,485 miles will be by water

LAYING THE RAILS BETWEEN STANLEYVILLE AND PONTHIERVILLE.

and 986 miles by railway. The inland terminus of the route will be in the southeastern province of Katanga, the richest mineral region of the State, and pronounced by experts to be one of the great future sources of the world's copper supply.

The Congo State has issued a pamphlet descriptive of the building of "Le Chemin de fer du Congo Supérieur," between Stanleyville and Ponthierville. It is well illustrated with half-tone photographs and maps. The grading of the new road-bed began in 1903. The route is entirely through dense forest along the left side of the Congo, and through this forest a clearing was made so wide that the railway and telegraph line cannot be damaged by falling trees. Many of the bridges were built of wood; but these will soon be replaced by steel. Steel aqueducts were employed to conduct small streams under the road-bed. Railroad ties and other timber used in constructing the road were sawed in mills at

various points along the line. The *bombali* tree is believed to yield the best ties that have yet been placed on railroads in tropical Africa. This is a kind of cedar, close-grained and hard, dark, and a little reddish.

Brick clays were utilized for the production of large quantities of brick used in the construction of buildings along the route. Limestone was brought about 100 miles from near the Aruwimi River, and a large amount of lime was burned in kilns near Stanleyville. Most of the white personnel were Belgians, though the directing force also included Italians, Scandinavians, and Swiss. Most of the machinists, masons, etc., were natives trained in the trade-schools of West Africa, who came voluntarily to the Congo seeking work. They were assisted by many young Congolese who had been trained in the trade-schools, maintained by the Government or the missionary societies. From 80 to 160 white men were employed on the line and about 2,000 blacks.

The black workmen lived in native huts, which they could build in a few hours as they moved forward along the line. They had with them their wives and children; for they are more contented and work better when their family life is not broken. The State provided them with ample supplies of rice and salt, the women using much of the salt to purchase vegetables in the native markets. Two physicians were constantly with the force; two hospitals, for the whites and blacks respectively, were maintained at Stanleyville; every sanitary precaution was taken to preserve the general health, and all the blacks were subjected to vaccination. The death-list among both whites and blacks was very small.

The cost of building the line was from 65,000 to 80,000 francs per kilometer. This included the enormous cost of transporting steel rails from Europe—about 12,000 francs per kilometer. As soon as the railroad reached Ponthierville two steamboats were launched on the narrow navigable stretch of the river, and a large force of workmen was taken up to Kindu to begin the building of the third and last railroad around the Congo cataracts.

Climate in the Lake Chad Region.—Recent notes concerning the seasons and winds in the Lake Chad district of Africa, by Audoin, are summarized in the *Meteorologische Zeitschrift,* Vol. 23, October, 1906. From the middle of October to the middle of March northeast winds—the normal trades—prevail, often attaining the velocity of a fresh breeze and producing considerable waves in the lake. After the spring equinox these northeast winds decrease in velocity and regularity, calms and variable winds are frequent; small dry "tornadoes" from the southwest occur, and the temperature rises. In the second half of April the seasonal change is completed; it is hotter; the humidity increases markedly; lightning is seen in south and west; thunder is heard; squalls bring a few drops of rain and the southwest winds set in. These southwest winds are neither as regular nor as strong as those from northeast. There are three seasons. The first, cool, or even cold, from the middle of November to the middle of March, when the northeast trades blow. The temperature maxima are between 79° and 82.5°. In the morning before sunrise the temperature falls 7°-9°, with northeast winds. It is warmer when there is a calm or a southwest wind. The second season is hot. It lasts from the middle of March to the middle of July. The temperature rises considerably, and even the nights are warm. Tornadoes, occasionally with rain, occur over the lake. The third, rainy season, with high water, lasts from mid-July to mid-November. It is then cooler. Tornadoes from different directions bring rains of short duration. The water rises occasionally into mid-December. In 1903 the lake level rose about two feet.

The decreasing depth of the lake is given special attention. This decrease is said to have been going on for decades. The lake has already diminished decidedly in area, and has retreated far from its former shores. The desiccation is general, extending over the whole lake, and not being merely a result of the displacement of the water from east to west, as has been occasionally assumed.

A second paper on the Lake Chad region, by Captain C. H. Foulkes (*Scot. Geogr. Mag.,* Nov., 1906), adds further facts of climatological interest. The climate along the new Anglo-French frontier between the Niger and Lake Chad is comparatively healthy during the dry season, except on the banks of the Niger and on the marshes of the lake, but in the rains it is unhealthy and similar to that on the coast. Europeans became anæmic and enervated, and suffer much from malaria and dysentery. In the dry season the air is filled with fine dust borne by the Harmattan, and objects only a quarter of a mile away are often hard to see. The tornadoes above noted can be seen approaching a mile or two away, their "progress being marked by bushes and trees bent over almost horizontally by the wind, and a long line of churned-up sand." This sand penetrates even "water-tight" tin cases. During the rainy season dry river-beds become rushing streams. After the rainy season the pools of water disappear; rivers dry up, and the only water obtainable is from deep wells in or near the villages. A curious case of seasonal migration into the desert is related of the Tuaregs, who inhabit part of this region. The upper class of these people is nomadic, for the most part, and in the wet season retires into the desert with the camels, which cannot live through the rains. R. DEC. W.

RAINFALL BY CALENDAR AND CROP YEARS AT ALGIERS.—The importance of averaging rainfall data by crop rather than by calendar years when studies of crop production are undertaken is clearly emphasized in a recent study of the rainfall of Algiers from 1868, to 1905, by Ch. Rivière (*Met. Zeitschr.,* Oct., 1906). When the crop year is taken as the basis of the rainfall summary (Sept. 1-Aug. 31) there is a fairly constant relation between the measured precipitation and the harvest. The calendar year 1873 had a normal precipitation of 27.44 inches, which does not in any way explain the actual crop conditions of that year. If, however, the year is begun with September the annual rainfall is 18.92 inches, the lowest in the thirty-seven years of observations. Similarly, in 1881, the calendar year gave 27.90 inches, which does not explain the crop failures and resulting famine of that year. The crop year September, 1880-August 31, 1881, gives the small amount of 19.08 inches, which was insufficient for a good crop. The spring rains from February 15 to May 15 are critical for agriculture in Algeria. After that time a favourable distribution rather than the amount of the rainfall is important. The crop year 1904-05 had a heavy precipitation of 32.39 inches; but the crop was poor, because between March 15 and May 15 the rainfall was deficient. The July and August rains are infrequent and small. In some years these months are rainless. R. DEC. W.

RADIATION PHENOMENA IN SOUTH AFRICA.—Over the bare surface and in the dry air of the Orange River Colony, whose average height above sea-level is over 4,000 feet, local meteorological phenomena which depend upon radiation from sun and from the earth's surface are well marked. At night the descending air drainage from the tops of the kopjes is often clearly visible. At Bloemfontein the military cantonments are on a kopje, and at sunset the smoke from this source makes it possible to trace a complete system of cold air wending its way

into the basin in which the city lies. The tops of the kopjes are distinctly warmer than the air over the lower ground, and it is therefore more comfortable to bivouac at the higher levels. Mirages and looming are common, the transition between the warmer air above and the colder air below, in the hollows, being often very marked. Dust-whirls are of frequent occurrence during the warmer hours, varying in size from a few inches in diameter to a hundred feet. They move at the rate of about six miles an hour at a maximum, but the speed of rotation is often fifty to sixty miles an hour. Cumulus clouds are a characteristic feature of summer afternoons. When atmospheric instability becomes very marked, violent afternoon squalls of dust, thunder, lightning, rain, and even hail, occur.—(*Symons's Met. Mag.*, Oct., 1906.) R. DEC. W.

AMERICA.

MAGNETIC WORK IN CANADA.—Dr. L. A. Bauer, assisted by Messrs. P. H. Dike and E. H. Bowen of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, determined during September and October the three magnetic elements (declination, dip, and intensity) at 70 stations in the portion of Canada bounded by the parallels of latitude 42° and 49° and the meridians of longitude 65° and 105° West. In this region very few observations had previously been made. With the completion of this work it is now possible to extend the magnetic maps for the United States up to the forty-ninth parallel across the entire continent. The standard magnetic instruments of the Toronto Magnetic Observatory were likewise compared with those at the Cheltenham Magnetic Observatory, making it possible thereby to reduce all of the magnetic work in the United States and Canada to the same standard. Through the courtesy of Professor Stupart, Director of the Canadian Meteorological Service, the Toronto Magnetic Observatory situated at Agincourt was made available as the base station for the work undertaken by the Carnegie Institution.

THE MAGNETIC SURVEY OF THE PACIFIC.—Dr. Bauer informs the Society that the Magnetic Survey Yacht *Galilee* of the Carnegie Institution of Washington returned to San Diego, Cal., on Oct. 20, having successfully concluded, under the command of Mr. W. J. Peters since March 2d, a cruise of 20,000 miles, embracing San Diego, Fanning Island, Samoan Islands, Fiji Islands, Marshall Islands, Guam, Yokohama, and return to San Diego. Mr. Peters's assistants were Messrs. J. P. Ault and J. C. Pearson, Magnetic Observers, and Dr. H. E. Martyn, Surgeon and Recorder. The sailing master, as in the cruise of 1905, was Captain J. T. Hayes. The two cruises of 1905 and 1906 of this vessel have already furnished sufficient data for the revision of the present magnetic charts of the North Pacific Ocean.

It was expected to despatch the vessel soon on a cruise to Valparaiso, Rio de Janeiro, Washington, D. C., and thence to the Pacific Ocean by way of the Cape of Good Hope and the Philippines in order to obtain some results as soon as possible in the other oceans. It was finally decided, however, that it would not be advisable to undertake the circumnavigation cruise in the present vessel. The work will, therefore, be confined at present to the practical completion of the magnetic survey of the North Pacific, as far as that can be done in a sailing vessel. The *Galilee* will start out in December from San Diego and proceed to the Marquesas Islands, and thence to Tahiti, Apia, Yap, Shanghai, Hongkong, Yokohama, Honolulu, Dutch Harbor, Sitka, and back to San Diego.

The remaining work in the North Pacific is in regions near islands and coasts where a vessel with auxiliary power will be needed. The Survey now urgently needs a specially-constructed non-magnetic, auxiliary-powered wooden sailing vessel to carry on the oceanic magnetic surveys in conformity with all the scientific requirements involved and with due regard to the safety and comfort of the observing party. Preliminary plans and specifications for such a vessel have been drawn up, and it is found that she will cost about $75,000. The Survey should be equipped with the most approved appliances known to science. Instruments and methods have reached the highest stage of perfection, but it now remains to supply a vessel which will not necessitate the determination of deviation corrections. "Swinging ship" at sea is more or less troublesome, especially under sail. The cruises of the *Galilee* have proved that observations on the course may be taken with all necessary scientific accuracy, provided the observers are certain of the deviation corrections on the particular course traversed. These corrections depend, not alone upon certain mathematical laws, but also upon accidental factors which cannot be adequately considered in mathematical formulæ.

CHANGES ALONG NEW JERSEY COAST.—Under the above title, Mr. Lewis M. Haupt has prepared a most interesting paper, published in the Annual Report of the State Geologist of New Jersey for 1905. He points out that this coast is one of the most dangerous in the United States, and one in which there is no harbour of refuge, in spite of the urgent demand for one, which has frequently been pressed. Between Sandy Hook and Delaware breakwater, a distance of 134 miles, there are believed to be more disasters to ships than on any other stretch of coast-line of equal length in the country. Within the twenty-three-mile range of the lighthouse at Atlantic City 170 casualties were reported in ten years, as compared with 83 within range of the light at Fire Island, and 25 in the dreaded Cape Hatteras region.

The New Jersey coast has importance, also, from an entirely different standpoint. It has come to be one of the most important coast resorts in the country. In fact, in some sections the value of property has increased many thousandfold as a result of this development. In Atlantic City, for example, in twenty-six years the resident population has increased from 6,000 to nearly 40,000, while the transient population exceeds 200,000.

Both the industry of shipping and the entertainment of summer guests are influenced by the marked changes in progress along this coast. These changes are of several kinds. In the first place, inlets are rapidly closing, and harbours which were accessible to coasters within the memory of men now living near them are being closed by a drift of sediment. In the second place, there are numerous instances of the cutting away of beaches and the destruction of valuable property by the attack of the waves. In the third place, the bar-like beaches are being extended by the drift of sediment along the coast before the prevailing waves, and eaten away on the ends exposed to these waves.

For example, the spit which forms the northern boundary of the entrance to Little Egg Harbor has moved southward at the average annual rate of 168 feet between 1769 and 1885, and since 1885 at the rate of about 200 feet a year. Changes at this point are illustrated by the resort known as Sea Haven, which is now laid out across what was formerly a navigable channel. While the spits are being built southward across inlets, the opposite sides of the inlets are being worn away by the wave attack and tide scour. At Hereford Inlet, a few years

ago, the Hotel Royal stood on what is now an extensive mud flat, covering an area of one square mile, and exposed only at low water. This hotel has been moved back three times to escape destruction from the rapid encroachment of the inlet.

Haupt gives many instances similar to this along the New Jersey coast, some of them illustrated by photographs and maps, on which successive changes are marked. It is an important article to the student of geography, and deals with a subject of great interest to the nation. One of the chief points of his paper is to consider the question of what is to be done to stop these changes, and in this discussion he points out the fact that many of the efforts that have been made are of little avail. Is it impossible to abstract his discussion of this subject, but his general conclusion is "that there is urgent need for remedial legislation looking to the opening of the harbours, the reclamation of the beaches and extension of the seaside resorts, the increase in the accessibility of all parts of the shore and its adjacent waters, the establishment of permanent land-marks along the coast, the encouraging and restoration of the fishing, ship-building, and manufacturing interests along the seaboard, and the utilization of the tidal power and reclamation of the tide flats as a source of wealth." R. S. T.

THE DEVELOPMENT OF SANDY HOOK.—In the same article Mr. Haupt notes the changes in the Sandy Hook region. This hook is a region of deposit of sediment supplied by wave attack upon the highlands to the south and drifted northward before the waves and tidal currents. According to the maps of the Ratzer surveys of 1769, the Navesink Highlands, which attain an elevation of 240 feet above sea-level, were at that time open to the full force of the Atlantic waves. The fact that salt marshes are absent north of Navesink River, which then apparently entered the ocean directly, is further indication of the recency of the deposit which now protects these bluffs from the ocean waves. It is believed, therefore, that since 1769 the drift of sediment from the bluffs to the southward has gradually overlapped the face of the Navesink Highland cliffs, closing the mouths of the Shrewsbury and Navesink Rivers, as is at present the case. The present supply for the continued growth of Sandy Hook is now derived from the bluffs between Monmouth and Bay Head, and here the coast-line is rapidly receding.

It is a well-known fact that the persistent and continued growth of Sandy Hook, particularly of its submerged portion, is a constant menace to ships entering New York Harbor; and large sums of money have been expended by the United States Government in deepening and maintaining this channel. Since the cause for this condition is the supply of shore drift derived by wave attack from the cliffs to the south, it is evident "that the arrest of this shore drift would manifestly aid in the securing and maintenance of deeper channels at that important highway of commerce." R. S. T.

RAINFALL IN THE GREAT LAKE REGION.—Professor M. S. W. Jefferson, of the State Normal School, Ypsilanti, Mich., has constructed a map of the rainfall in the region about the Great Lakes, in preparing which the rainfall data for shorter periods are reduced to long series, in the way which has long been recognized abroad as essential if accuracy is desired, but which, thus far, has received practically no attention whatever in the United States. The period for reduction is 1880-1904; 143 stations were used. Of these stations, 48 have records for from five to nine years only. A rainfall chart, in constructing which the data

were employed without regard to the length of the period of observation, is given for purpose of comparison, and it is somewhat surprising to see that the changes resulting from the reductions to a uniform period are comparatively very slight. Some study of the relation of the Lake rainfall to topography is made, and there is a general, though brief, discussion of the distribution of rainfall. For purposes of comparison, a chart is given in which incomplete rainfall records are reduced with reference to the means of six groups of selected stations; another, published by the Weather Bureau in 1902, in which some reduction of short series to long series was attempted, and another, prepared by C. A. Schneider, originally published in 1900. The author is quite right when he claims that his new rainfall chart is an advance on its predecessors.

R. DEC. W.

CLIMATE OF CANADA.—At the recent York meeting of the British Association, Professor L. W. Lyde read a paper on the "Climate of the Wheat Area of Central Canada," showing how the climatic conditions favour the growth of the crop, especially along a line through Brandon and Battleford. A high estimate of the probable output of wheat from this area in the immediate future was given, but the opinion is expressed that wheat-growing here is eminently the work of the small farmer. So far as wheat cultivation is concerned, spring is limited to the four weeks in April. With a unit of population (one family of five persons, at least two being males) the maximum of plough, harrow, and drill that can be "risked" is 80 acres in the four weeks. In summer, which is the rainy season, the duration of sunlight varies from about 15½ hours a day at midsummer in the Winnipeg district to over 17 hours at Prince Albert. The length and intensity of the cold winter do not affect the northern limit of wheat in summer.

R. DEC. W.

GEOGRAPHIC INFLUENCE IN AMERICAN TRADE.—Commercial America in 1905, a publication of the Bureau of Statistics of the Department of Commerce and Labor, while purposing to show the Commerce, Production, Transportation, Finance, Area and Population" of the American countries, makes apparent some of the reasons for the present deplored conditions of our trade with the other American states.

Proximity and physical freedom of intercourse are shown to be two strong factors, as follows: Imports of all North America other than the United States are $531,000,000, of which 54.7 per cent. came from the United States; imports of all South America are $474,000,000, of which only 13.5 per cent. came from the United States. Exports of all North America except United States are $537,000,000, of which 53.9 per cent. goes to the United States; exports of all South America are $702,000,000, and only 20.2 per cent. goes to the United States.

When proximity is made to include physical freedom for intercourse these figures show an interesting agreement between distance from the United States and the relative value of commerce with the United States. As we analyze still more closely, the commerce of seven selected countries in 1904 sets forth a similar ratio between trade and distance. Imports from the United States amounted to: 59 per cent. of Canada's imports; 56 per cent. of Mexico's; 43 per cent. of Central America's; 34 per cent. of Colombia's; 11 per cent. of Brazil's; 13 per cent. of Argentina's; 12 per cent. of Chile's. The relative approachableness of Brazil to New York and Liverpool is also suggested in the fifth item.

Other geographic reasons for our relatively small trade with South America are found in the following facts:

(1) The population of South America is sparse, the total, according to Supan (1904), being 38,482,000.

(2) It is at present still essentially an agricultural country, while our heaviest exports are agricultural (over 55 per cent. of all our exports in 1905 were of this class).

(3) Owing to climatic differences existing between the various South American countries, about 30 per cent. of their imports come from their near neighbours.

(4) The people of European countries, whose dense population makes them more essentially manufacturing than we, succeed in placing their manufactures in South American markets, to our exclusion.

(5) Products of Europe, South America, and the United States, by virtue of climatic and industrial conditions, are such that three-cornered trade is common—*i. e.,* vessels from South America to the United States load with rubber, coffee, hides, and wool, which they exchange with us for grain and provisions, and then sail to Europe, where they exchange our products for manufactures, and return to South America. This is further encouraged by the fact that we send more to Europe than we buy from her.

(6) A study of the map of the Atlantic, especially on a globe, will reveal the fact that some of the South American ports are nearer to European centres than they are to our own, and that most of them are at least as convenient to European countries as to us.

Another handicap to our South American trade, though not geographic in itself, has in part grown out of geographic conditions. Most of the vessels carrying goods to South American ports are controlled by European capital.

The above-mentioned report further mentions the lack of banking and business facilities between the United States and South American states, and the neglect of our merchants and manufacturers to study and heed trade methods and requirements of the South American market.

One conclusion reached is that improvements which shorten the distance between us and our South American neighbours make for increased commerce. Thus the author sees improved trade with the opening of the Isthmian Canal and the completion of the Trans-Andean railroad from Argentina to Chile. With these and a larger number of American vessels to both Atlantic and Pacific ports we may expect a more gratifying commercial intercourse.

The report is completed with many tables of statistics analysing the industries and trade of each country. G. D. H.

ASIA.

THE PILGRIM RAILROAD TO MECCA.—The building of the Pilgrim Railroad which is to connect Damascus with Medina and Mecca, the holy cities of Islam, has not attracted much attention in the Occident. Auler Pasha, a German military officer, now a general in the Turkish army, who has had the best opportunities for studying this great project, has filled this important gap in our knowledge of great railroad enterprises by writing an exhaustive paper, with a good map, which appears as *Ergänzungsheft* No. 154 of *Petermanns Mitteilungen.*

The *Irade* of the Sultan of Turkey calling upon Mohammedans in every land

to supply the means for building the road was issued in July, 1900. The contributions have been large and continuous and are supplying nearly all the funds. There is no longer any doubt that the project will be completely carried out. The entire length of the line between Damascus and Mecca will be 1,800 kilometers. In 1904, the section Damascus-Mahân (459 km.) was completed. Last year the line was extended to Mudewwere, 572 km. from Damascus. By the end of this year it will be opened to Tebuk, 670 km. In other words, by the end of this year over one-third of the line between Damascus and Mecca will be in operation.

Every Moslem who can afford the expense expects to make the pilgrimage to Mecca at least once in his life. Most of the pilgrims, averaging about 100,000 a year, reach the Holy City by the sea route to Jiddah and the caravan road from that Red Sea port to Mecca. Only about 10,000 pilgrims, chiefly Syrians, take the long and difficult desert route from Damascus. It is to enable numerous pilgrims from European Turkey, Asia Minor, Persia, and north Africa to make the journey more expeditiously, comfortably, and cheaply that the Pilgrim Railroad was projected. It is intended that the pilgrimage shall be placed within the reach even of many poor Mohammedans.

But, in addition to the religious purpose to be served, the railroad will undoubtedly be of great strategical importance at the Turkish Government. The nomads of the Arabian desert will be within reach of Turkey's military arm, and pilgrims will be safeguarded against their attacks. During the rebellion in Yemen in 1905 the Sultan sent battalions of infantry southward over the completed part of the road to within four days' march of the Gulf of Akaba, Red Sea, where steamers awaited them, and the troops reached Yemen, it is said, in eight days' less time than would have been required by way of the Suez Canal.

At the end of 1905, 46,700,000 francs had been expended in construction works, most of the money being the offerings of the Faithful, a small part, however, being raised by the stamp tax and the revenue from the sulphur and phosphate mining works along the railroad.

All of the technical staff are foreigners, the chief engineer, Meissner Pasha, being German. Austrians and Italians, as well as Germans, are prominent in the more responsible positions. Most of the railroad material, such as rails, ties, and rolling stock, is imported. All the artisans and common labourers are Turkish soldiers detailed for the work, and 5,700 of them are now engaged in it. They receive a small advance on their regular pay, and their religious zeal helps them to endure with fortitude the unusual discomforts of hard labour in a desert glowing with heat.

The line has been built southward from Damascus parallel with the Jordan Valley and 50 to 60 kilometers from it, following chiefly the old pilgrim road through the basin of Hauran and the east Jordan lands to the Arabian desert, through which it is now being extended towards Medina. The cost of transporting all the railroad material over the French railroad from Beirut to Damascus and southward steadily increased as the road progressed. It was, therefore, decided to build a branch from the port of Haifa to the Pilgrim Railroad, at Dera. This branch, 161 kilometers long, was opened to business on Sept. 1, 1903. Being a part of the Pilgrim Road, the branch not only cheapens the transportation of building material, but is expected, also, to serve in future as a short cut by which many thousands of pilgrims from the Mediterranean will reach the main railroad.

The main line is being extended almost entirely over a waterless and desert highland, where no vegetation grows and very few people live. For hundreds of miles there is not a single permanent human settlement within 50 to 100 kilometers of the track. There are a few small oases in the waste, but the entire country from Damascus to Medina is occupied only by small bands of Bedouin nomads and their flocks. Between Damascus and Mudewwere 1,532 bridges, aqueducts, cuttings, and other artificial works have been required. The greatest difficulty is the scarcity of water. It is derived from a few scattering cisterns and wells; and to the south the embarrassment is intensified. Efforts are being made to relieve the situation by sinking new wells, some of them artesian. All the water now used for drinking and cooking purposes and for preparing mortar is carried to the railhead in water-cars. This adds much to the cost of the enterprise.

The country supplies no wood, coal, or petroleum, but all fuel must be imported. Fortunately, the climate is so warm that little fuel will be required excepting for the locomotives and machine shops. Plenty of stone is found *in situ* for constructing the station buildings, bridges, etc. The rolling stock, imported from Germany and Belgium, includes at present 43 locomotives, 522 freight, and 31 passenger cars and 15 water-cars. Three round trips are made each week between Damascus and Mudewwere, and during the height of the pilgrim season five passenger trains leave Damascus daily for the railhead, where caravans of camels are kept in readiness to carry the pilgrims on their way. The average speed of passenger trains as yet is only twenty-three kilometers an hour. It is expected that the present rate of construction will be maintained until the road is completed. If this hope is realized trains will be running to Mecca in 1915.

The French Lebanon Company has completed its railroad from Damascus northward to Hama, and will soon be able to run trains still farther north to Aleppo. It is expected that before the Pilgrim Railroad is completed the German line through Asia Minor will be finished to Bagdad and the Persian Gulf. The French line need be extended only a short distance northward from Aleppo to join the German line. Mecca will then have 3,700 kilometers of continuous rail connections, extending from Constantinople (Skutari) across Asia Minor to the Persian Gulf. The Pilgrim Railroad will be thronged with devotees from European Turkey, Asia Minor, and Persia, who will make the journey to the holy cities practically all the way by rail.

Changes of Climate in Asia Minor.—Evidence of changes of climate within historic times has often been based on the fact that where now we find small populations and abandoned wells or irrigation works, there were formerly more inhabitants, extended irrigation, and abundant vegetation. These supposed changes of climate are, however, often easy to explain on the ground of a change in the habits of the people, in their government, or in their numbers. In his address on *Past and Present in Asia Minor,* delivered before the York meeting of the British Association, Professor Ramsay brought out this very point. The conquest of Asia Minor by the Turks meant the reduction of a great part of the country from a settled and civilized state to a semi-nomadic condition. The industries of the Roman Empire gradually died out in large measure, some surviving until now and some having disappeared within the memory of living men. The land to a great extent passed out of cultivation; irrigation works were destroyed or fell to pieces; the land became stony; terraces were destroyed. The only cure

is to be sought in generations of peasant proprietors. The olive almost ceased to be cultivated, not, it should be noted, because of change of climate, but because of change in the habits of the people. Recently there has come a revival of prosperity. Communication by roads and railways is being restored. Industries are reviving; an industrial population is spreading along the railways. Agriculture is being developed; cotton is being grown; the waste land around Smyrna is being reclaimed because *bona-fide* cultivators are securing allotments of land. The whole picture furnishes an excellent illustration of how man, if he be so disposed, can largely master climatic handicaps. A change in man, not of climate, has been taking place in Asia Minor. R. DEC. W.

EUROPE.

THE TROUGH OF THE RHINE WHERE IT ENTERS LAKE CONSTANCE.—In Col. J. J. Lochmann's paper "De la Cartographie en Suisse" (*Le Globe,* Geneva, Tome 45, 1906) he gives some details concerning the trough, revealed by soundings, which the Rhine has made at its entrance into the lake. This deep and narrow trench is bordered by embankments, composed of sand and alluvial material. M. Forel advanced the following explanation:

The water which the Rhine pours into Lake Constance is much colder than that of the lake, and therefore sinks to the bottom and continues its course with a part of the velocity it had attained. Thus it deepens its channel on the lake floor; furthermore, being heavily charged with alluvium, it deposits this material to the right and left of its course. It has thus both excavated the lake floor and raised embankments on either side above the general level of the lake bottom. The trough and accompanying embankment do not follow a straight line, but form capricious meanders as far as Arbon, about six miles from the Rhine's entrance into the lake. There the trough widens, but is less deep, and finally disappears.

Other affluents of the lake do not produce the same effects, probably because their waters are not so cold and are inferior in volume and do not carry so much alluvium.

This discovery, made in 1885, raised the question whether similar phenomena would be found in Lake Geneva where it receives the Rhône. Investigation shows that the same condition of things exists on the floor of that lake. The sub-lacustrine ravine is, however, a little longer than in Lake Constance, and has a straighter course. None of the other affluents of Lake Geneva shows the same phenomena.

FORESTS AND RAINFALL.—The ever-recurring problem concerning the influence of forests upon the amount of rainfall is gradually being solved in the only possible satisfactory way—namely, by careful studies of the influence of different exposures of the rain-gauge, of wind, and of snowfall upon the resulting catch. Dr. J. Schubert, of the Meteorological Division of the Forest Experiment Station of Prussia, is giving this matter careful attention, and his conclusions are certain to be of very great service in throwing light on this very obscure question. Hitherto, hasty generalizations, based on incomplete and inaccurate data, have been widely quoted and have found general acceptance. The observations recently carried out were made in western Prussia and Posen. They showed at first a probable excess of 2.3% at a station in an opening within the forest in western Prussia, and of 0.8% at a similar station in Posen as compared with

stations outside the forest, the distance from the forest being 1 km. in both cases. The general result is similar to that previously obtained in Silesia, in showing a larger measured rainfall at forest stations than in the open, the excess *averaging* at a maximum between 1 and 2%, the distance of the forest being 1 km. in all cases. This value, however, is an outside limit of the forest influence, for no account is here taken of the effect of wind on the rainfall catch. Careful observations show that the effect of wind in a forest opening is an important factor in giving somewhat larger precipitation there than in the open. All rainfall data from forest stations which are not corrected for wind effects are misleading, in that they exaggerate the forest influence. It is also clear that the amount of snowfall caught in the gauge is much affected by wind, and that the error of an unprotected gauge increases with the number of days with snow. Hence a forest gauge will show more precipitation the more snowfall there is. Dr. Schubert comes to the conclusion that, when the influence of the wind is taken into account, his forest station does not show more precipitation than the open. R. DEC. W.

THE NINTH INTERNATIONAL GEOGRAPHICAL CONGRESS: CIRCULAR OF INVITATION, PRELIMINARY INFORMATION AND PROGRAMME.—The Congress will be held at Geneva from the 27th of July to the 6th of August, 1908. Membership may be acquired by payment of 25 francs (=20 marks=1 pound sterling=five dollars) to M. Paul Bonna, Treasurer of the Committee on Organization, 3 Boulevard du Théâtre, Geneva. An additional payment of 12.50 francs will secure a card of admittance for a lady or a person under twenty years of age. These will enjoy all the privileges of members except the rights of voting and of receiving the publications. Payment must, in every case, be made in advance.

The sessions of the Congress will be of two kinds: the General Sessions, of which there will be at least eight, and the Sessions of the Sections.

The Sections will be constituted as follows (subject to modification by the Committee on Organization):

Mathematical Geography and Cartography;
Physical Geography in General;
Vulcanology and Seismology;
Glaciers;
Hydrography (Potamography and Limnology):
Oceanography;
Meteorology and Climatology;—Terrestrial Magnetism;
Biological Geography (Botanical Geography and Zoogeography);
Anthropology and Ethnography;
Explorations;
Economical and Social Geography;
Teaching of Geography;
Historical Geography.

Every communication or paper intended for the Congress must be accompanied by a résumé clearly written, or typewritten, on one side of the leaf, and not more than 300 words in length, to be sent in as soon as possible and at the very latest by November 30, 1907, to the Committee on Organization. By this Committee the résumé will be referred to the proper scientific Commission for examination and the Executive Commission will report to the author, without delay, the decision made. The national tongues of Switzerland—German, French and Italian—and the English language are the recognized languages of the Congress. Communications, oral or written, may be made in any one of these four languages, and memoirs may be submitted also in Latin. The length of communications, whether read or spoken, is limited to fifteen minutes or, by

special exception, to twenty minutes. This limitation applies also to discussions. The members of the Congress will understand the necessity of complying with this arrangement and the presiding officers will see that it is strictly observed, since upon this will depend the carrying out of the programme, the orderly conduct and the success of the Congress.

This regulation relates only to the sessions of the Sections. In fixing the order of the day for the General Sessions the Executive Commission will determine the time to be allotted to each object.

The Committee on Organization will establish, in 1907, the definitive rules and programme of the Congress and of the Sections, so that they may be brought to the knowledge of all who are interested by the month of January, 1908.

This Committee will be charged with the management of the Congress when assembled and with the carrying out of the programme.

After the Congress, the Committee on Organization will publish the Compte Rendu (reports, memoirs, resolutions, &c.), if it can be done in 1909, and in any case before the close of the year 1910. The Compte Rendu will be sent *free* to each member of the Congress.

The Honorary Presidents of the Congress are:

The President of the Swiss Confederation;

The President of the Council of State of the Republic and Canton of Geneva;

H. M. Leopold II., King of the Belgians, Sovereign of the Congo Free State;

H. M. Charles I., King of Rumania.

The President is M. Arthur de Claparède, the President of the Geographical Society of Geneva.

The long list of the Honorary Vice-Presidents is headed by the four surviving presidents of the preceding International Congresses:

The Duke di Sermoneta, Prince of Teano (Congress of Venice, 1881);

Dr. Albert Gobat, Councillor of State and National Councillor (Congress of Berne, 1891);

Sir Clements R. Markham (Congress of London, 1895);

Commander Robert E. Peary, U. S. N. (Congress of 1904, in the United States).

PERIODICITY IN THE TEMPERATURE OF STOCKHOLM.—Woeikof has investigated the temperatures at Stockholm for the 150 years 1757 to 1906, inclusive (*Met. Zeitschr,* Oct., 1906), without prejudice in favour of any definite periodicity, such as that of the sunspots, or the Brückner 35-year cycle. It appears that Stockholm has a very warm winter in every eighth year, January being the most concerned in this departure and February the least, of the winter months. As, especially in winter, similar departures from the mean extend over large areas, this phenomenon is probably to be found over much of Europe. Woeikof has already shown that it holds in St. Petersburg. Woeikof is not inclined to look for any cosmic influence in this eight-year period, but seeks the cause in a shift in the location of the areas of high and low pressure, which results in giving cold winters in the south, and especially in the southeast, of Europe when the winters are warm in the north. R. DEC. W.

MARSEILLES GEOGRAPHICAL SOCIETY.—The Geographical Society of Marseilles is thirty years of age this year. The first number of the thirtieth volume of its *Bulletin* celebrates the occasion by publishing the history of the Society, a list of its members, and an excellent index to the volumes of the *Bulletin,* which

will be welcomed in geographical circles generally as a useful bibliography. Among the illustrations are pictures of some of the past and present officers of the Society, and views of the Committee-room and library.

POLAR.

CAPTAIN AMUNDSEN RETURNS TO EUROPE.—Captain Roald Amundsen, his first officer, Lieut. Hansen, and the crew of the *Gjöa* arrived in New York on Nov. 6, having left their vessel at San Francisco. A short stop was made in Chicago, where, on the evening of Nov. 3, the Geographical Society of Chicago gave a banquet at the Union League Club in honour of Captain Amundsen's three and a half years of successful exploration in the region of the magnetic north pole, and the making of the Northwest Passage. Addresses were made by Captain Amundsen, Lieut. Hansen, Professor Henry J. Cox, President of the Geographical Society of Chicago; the Norwegian Consul, Frederick H. Gade, and by Professors R. D. Salisbury and T. C. Chamberlin of the University of Chicago.

On the evening of Nov. 7 the party were entertained at the rooms of the Germania Club, Brooklyn, at a dinner given in their honour by the members of the Norwegian Club of New York. Mr. Anton A. Raven, Recording Secretary of the American Geographical Society, represented the Society at the dinner. A letter was read from President Roosevelt congratulating Capain Amundsen on his Arctic work. Capt. Amundsen made a brief speech on the work of the expedition. Nov. 8, he sailed for Norway.

CANADIANS WINTERING IN THE ARCTIC.—The Canadian Government steamer *Arctic* sailed from Quebec last summer for northern latitudes *via* Greenland. She will winter in Lancaster Sound.

VARIOUS.

FURTHER EXPLORATIONS IN THE UPPER AIR.—*Science* says that the third cruise of the *Otaria,* the steamer yacht sent by M. Teisserenc de Bort, director of the private meteorological observatory at Trappes. near Paris, and by Mr. Rotch, director of the similar observatory at Blue Hill, near Boston, to explore the atmosphere over the tropical Atlantic, has ended, and the yacht has returned to Havre after a very successful voyage of three months and a half.

Atmospheric soundings with balloons and kites were executed over the central part of the North Atlantic, the equatorial regions, and the South Atlantic as far as Ascension Island. The soundings southwest and northwest of the Canaries confirm the conclusions reached during the two preceding cruises of the *Otaria* —namely, that the upper anti-trade blows from the southeast or southwest, not only within the tropics, but generally as far north as latitude 30°, and is found above the open ocean as well as above the Canaries. Farther north it is transformed into a westerly wind.

The observations with *ballons-sondes* revealed this new and important fact, that in summer over the equator very low temperatures (reaching — 80° C.) exist in the upper air above 12 kilometers, being analogous to those occurring in winter at the same height in our own latitude.

TROPICAL RAINS.—After a close study of tropical rains, extending over many years, and especially of the rainfall of Java, Woeikof comes to the conclusions here enumerated (*Met. Zeitschr.,* October, 1906):

1. The intensity of tropical rains is, on the average, greater than the intensity in middle latitudes.

2. The difference is not very great.

3. The heaviest sudden downpours have thus far been observed in middle latitudes.

4. General, light rains of considerable duration are known in many parts of the tropics, and even have special names. Such rains have long been known for the west coasts of South America and Africa, but in the foregoing statement other tropical districts are referred to.

5. The heaviest daily rainfalls have been observed outside the tropics, thus in Cherrapunji, Assam, 40.94 inches; Tanabe, in Japan, 35.51 inches, and at two other stations in northern India over 30 inches.

6. It is probable that the heaviest rains in the tropics fall during large cyclones.

7. A larger number of self-recording rain-gauges, and detailed discussion of the results, especially in cases of the heaviest rains, are very much to be desired.

8. It would be especially interesting to know whether in the tropics, as in the higher latitudes, the larger rainfall amounts on the windward sides of mountains do not depend on the longer duration of the rain, rather than on their greater intensity. R. DEC. W.

ISLANDERS OF TRISTAN DA CUNHA.—A Blue-Book, issued by the British Colonial Office, says that in view of the poverty of the islanders of Tristan da Cunha, correspondence was opened with the Ministry of Cape Colony concerning the deportation of the islanders to that colony. The Cape Ministry replied that it was prepared to share the cost and would send a representative to the island to lay the proposal before the inhabitants. Mr. Hammond Tooke was accordingly sent there; but as the majority of the islanders decided to remain, the Cape Government took no further steps. Most of the Blue-Book consists of an exhaustive report by Mr. Tooke on the islanders, including recommendations for the ameliorization of their condition. He proposed that a chaplain and schoolmaster should be appointed at an early date. The islanders numbered 15 males, 24 females, and 43 children. They are unable to contribute £75 for the salary of a schoolmaster, as was suggested by the Cape Government. In April last a clergyman and his wife went to the island for the purpose of ministering to the needs of the inhabitants.

NEW MAPS.

AFRICA.

EAST AFRICA PROTECTORATE.—Map to illustrate the "Masai, their Language, and Folklore." Scale, 42 miles to an inch. The Oxford Geographical Institution, 1905.

The map illustrates a book by Mr. A. C. Hollis with the above title. It shows the distribution of this tribe before they were collected on reservations. Masai names are written in red, and the territory occupied by the tribe, both in British and German East Africa, is tinted brown.

AFRICA.—Raised Map of Africa—(1) Physical Features, (2) Political Divisions with Guide. Weekly Summary, Eltham, Kent, England, 1906. (Price, 1s. 9d.)

The map is intended for the blind. Two sheets are modelled, one giving